RNA polymerase

RNA polymerase (RNAP or RNApol) (Ribonucleic acid), also known as DNA-dependent RNA polymerase, is an enzyme that produces primary transcript RNA.

In cells, RNAP is necessary for constructing RNA chains using DNA genes as templates, a process called transcription. RNA polymerase enzymes are essential to life and are found in all organisms and many viruses. In chemical terms, RNAP is a nucleotidyl transferase that polymerizes ribonucleotides at the 3' end of an RNA transcript.

RNA polymerase II mediates the transcription of all protein-coding genes in eukaryotic cells, a process that is fundamental to life. Genomic mutations altering this enzyme have not previously been linked to any pathology in humans, which is a testament to its indispensable role in cell biology. On the basis of a combination of next-generation genomic analyses of 775 meningiomas, Clark et al., report that recurrent somatic p.Gln403Lys or p.Leu438_His439del mutations in POLR2A, which encodes the catalytic subunit of RNA polymerase II (ref. 1), hijack this essential enzyme and drive neoplasia. POLR2A mutant tumors show dysregulation of key meningeal identity genes, including WNT6 and ZIC1/ZIC4. In addition to mutations in POLR2A, NF2, SMARCB1, TRAF7, KLF4, AKT1, PIK3CA, and SMO, we also report somatic mutations in AKT3, PIK3R1, PRKAR1A, and SUFU in meningiomas.

The results identify a role for essential transcriptional machinery in driving tumorigenesis and define mutually exclusive meningioma subgroups with distinct clinical and pathological features [1].

1)
Clark VE, Harmancı AS, Bai H, Youngblood MW, Lee TI, Baranoski JF, Ercan-Sencicek AG, Abraham BJ, Weintraub AS, Hnisz D, Simon M, Krischek B, Erson-Omay EZ, Henegariu O, Carrión-Grant G, Mishra-Gorur K, Durán D, Goldmann JE, Schramm J, Goldbrunner R, Piepmeier JM, Vortmeyer AO, Günel JM, Bilgüvar K, Yasuno K, Young RA, Günel M. Recurrent somatic mutations in POLR2A define a distinct subset of meningiomas. Nat Genet. 2016 Aug 22. doi: 10.1038/ng.3651. [Epub ahead of print] PubMed PMID: 27548314.